Fannia thelaziae, A New Species of Eye-Frequenting Fly of the *benjamini* group from California and Description of *F. conspicua* Female[1]

(Diptera: Muscidae)

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Fannia benjamini Malloch is a familiar eye-frequenting fly common to dry chaparral and oak woodland areas throughout California. Its annoying habit of frequenting the face and especially the eyes of animals in search of moisture and other substances has made *F. benjamini* the prime suspect as the intermediate host of the mammalian eyeworm, *Thelazia californiensis* Price (Winkler and Wagner, 1961). The eyeworm infests a variety of mammal hosts including deer, rabbits, dogs and man. Although developing stages of the worm were reported in *F. benjamini* (Burnett, *et al.*, 1957), recent transmission experiments provided no evidence of its association with this fly as an intermediate host (Weinmann, *et al.*, 1974).

In recent studies of the biology and oviposition behavior of *Fannia* species laboratory colonies were established at the University of California (Berkeley) (Anderson, J. R., C. J. Weinmann and P. Rubtzoff, unpubl. data). The original colony stock consisted of wild-caught flies captured at three sites in central and northern California during 1968. These laboratory colonies of flies were initially thought to consist only of *F. benjamini*, but minor differences in the eggs eventually produced suggested that a mixed colony with as many as three species was involved (op. cit.). Subsequent isolation and rearing of each type of egg yielded pure colonies of each species, *F. benjamini*, *F. conspicua* Malloch, and the new species described here. Only the latter proved to be suitable for the development of eyeworms to the infective stage (Weinmann, *et al.*, 1974).

Chillcott (1960) in his monographic revision of the Fanniinae recognized nine Nearctic species belonging to the *Fannia benjamini* group which could be divided further into three subgroups. *Fannia clavata* Chillcott and *micheneri* Chillcott were placed in the *vittata* subgroup, *setifera* Chillcott constituted the *setifera* subgroup, and six species were included in the *benjamini* subgroup: namely *F. arizonensis* Chillcott, *F. benjamini*, *F. conspicua*, *F. neotomaria* Chillcott, *F. operta* Chillcott, and *F. tescorum* Chillcott. Species in the latter subgroup are distin-

[1] Scientific paper 4561, College of Agriculture Research Center. Research was conducted under Project 9043.

guished from other *Fannia* by their yellow basal antennal segments and palpi, hind tibiae bearing one anterodorsal and two anteroventral bristles, and trimaculate abdomen. Additional characters uniting this subgroup include similarities in male genitalia and female spermathecae.

To facilitate comparisons between species in the *benjamini* subgroup treated here, the format for descriptions and illustrations follows that of Chillcott (1960) and the key to species of the subgroup is based primarily on characters used by him. The key to males is modified to include *F. tescorum* which was inadvertently omitted from the original key (see Chillcott, p. 43, couplet 15). Standard abbreviations were used for bristles and leg segments and include: anterodorsal (ad); anteroventral (av); posterodorsal (pd); posteroventral (pv); dorsal (d); acrosticals (acr); dorsocentrals (dc); coxa (C); femur (F); and tibia (T).

Fannia thelaziae new species

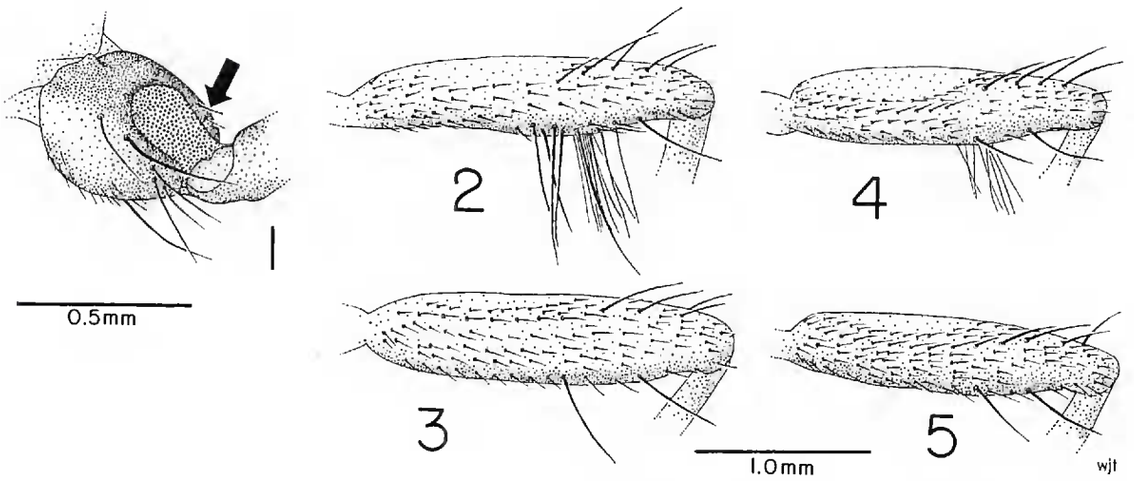
(Figs. 4–8)

MALE: *Head.*—Front with nine, strong bristles. Parafrontals narrow (0.04 increasing to 0.80 mm), gray pollinose. Parafacials narrow, shining gray, without setulae. Occipital bristles short, regular; postoccipital setulae on lower third, sparse. Second antennal segment yellow; third segment brownish black or sometimes very narrowly yellowish at base, arista brown and weakly pubescent. Palpus yellow, subspatulate. Theca normal.

Thorax.—Evenly brown pollinose, vittae only faintly indicated behind when viewed from rear. Scutellum concolorous with scutum, laterobasal spots distinct. Acrosticals (Acr) evenly triserial. Prealars one or (usually) two strong, short setulae; stigmatal setulae absent. Mesopleural bristling distinctly stronger anterodorsally. Squamae pale, lower with margin brownish and slightly larger and projecting more than upper; halter yellow.

Abdomen.—1.5 by 1.8 mm. Basal three segments distinctly translucent yellow laterally, grayish white pollen of darker portions reduced in these areas. Median vitta linear, dark brown, confluent with broad concolorous lateral brown marks on posterior area of basal segments, dark color encompassing entire fifth and following segments, color often obscured by grayish pollen.

Legs.—Legs brown, femora darkly infuscated basally; tibiae and tarsi black. F_1 pvs weak on basal half. T_1 ads weak, median bristle absent. F_2 avs on basal half 6 to 8, equally spaced, strong, none reduced to setulae, 3 median bristles stronger, followed by shorter and close-set comb of 14 to 16 bristles to apex; pvs with single strong bristle basally followed by shorter, partially double row of mixed bristles on basal half, then 6 to 8 stronger ones to three quarters, then decreasing in sizc to a close-set preapical comb of 6–10 short bristles, the comb tending slightly postero-dorsally. T_2 with biserial ventral mat, half tibial diameter on apical two-thirds, slightly stronger and longer on apical half. C_3 lacking pv setulae. F_3 (Fig. 4) normal in shape, avs prostrate becoming setulose on basal half and two (rarely three) strong, separated preapical bristles; pvs basally fine then with 8–10 long, slender bristles loosely clustered at two-thirds extending basad along the posterior surface as slender erect setulae. T_3 with two avs, one ad and no pv bristles.



FIGS. 1–5. FIG. 1. Hind coxa (posterolateral view) of *F. conspicua* showing position of pv bristles. FIGS. 2 and 3. Hind femora (anterior view) of *F. conspicua* male and female respectively. FIGS. 4 and 5. Same for *F. thelaziae* male and female respectively.

Hypopygium.—(Figs. 6, 7). Cercal plate simple, divided basally, but fused apically, slightly elongate, bristling weak. Surstylus broad and simple, elongate and parallel-sided, without swelling at base in side view. Baciliform process strongly spiraled, heavy.

FEMALE: *Head.*—Parafrontals brownish gray pollinose, wider than frontal vitta and convex along inner margin. Setulae uniserial, extending down onto parafacials well below aristal base. Third antennal segment entirely brown or very narrowly yellow at base. Palpus bright yellow, distinctly spatulate. Otherwise as in the male.

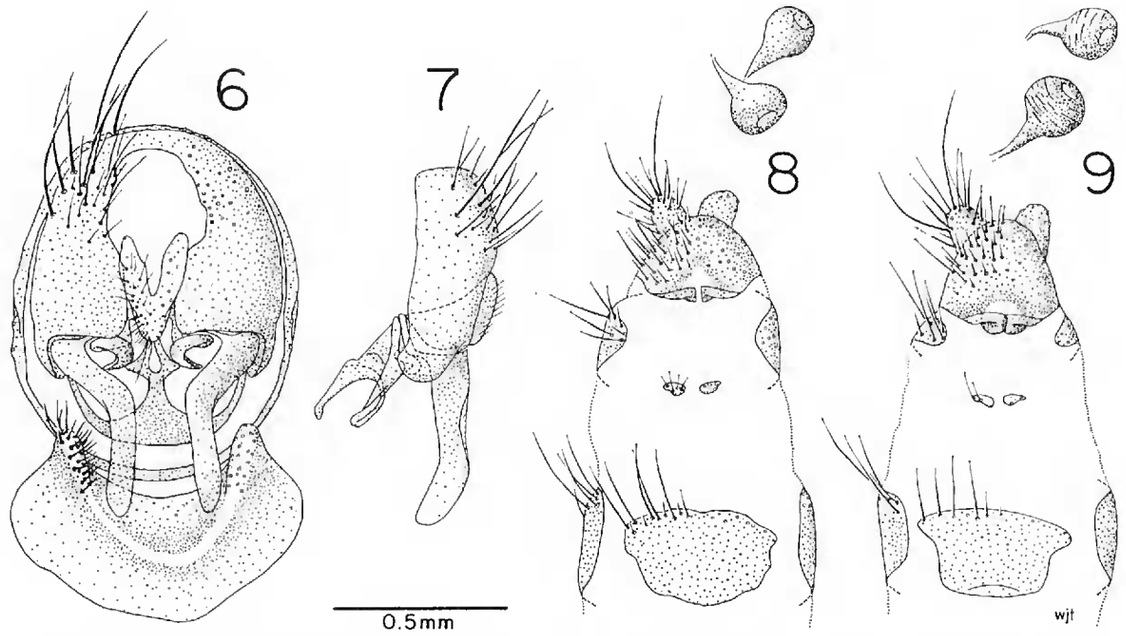
Thorax.—Distinctly gray to faintly brownish gray pollinose with single indistinct narrow brown vitta along acr row, lateral vittae present only as spots about bases of dc bristles and irregular brown markings around the intraalar row. Scutellum with two small, indistinct brown spots subbasally. Squamae with concolorous margins.

Abdomen.—Integumental color distinctly yellow on basal half of second and usually on third segment of abdomen, remainder gray pollinose with discontinuous median vitta and large brown lateral spots. Spermathecae two (Fig. 8).

Legs.—Yellowish brown. F_1 pvs evenly decreasing to base. F_2 avs and pvs with weak suberect setulae. T_2 medially with one each av, ad, pv and p subapical bristles, all subequal to tibial diameter, and 0–2 weak pvs. F_3 (Fig. 5) avs and pvs setulose except for two stronger preapical avs; T_3 ads and avs 1–2, limited to one median bristle each, two d bristles longer, one median and one subapical.

TYPE MATERIAL.—Holotype: Male, Hastings Reservation, Monterey County, California; laboratory reared from egg of female captured 18-IX-1969 (C. J. Weinmann). Allotype female, same data as holotype.

Paratypes, 368 ♂♂, 212 ♀♀. CALIFORNIA: Russelmann Park (nr. Mt. Diablo), Contra Costa County, 2 ♀♀ 10-IX-1969 (P. Rubtzoff); 17 ♂♂, 4 ♀♀, laboratory reared from eggs of females captured 10-IX-1969. University of California, Hopland Field Station (4 mi. east of Hopland), Mendocino County, 5 ♀♀ (11–18)-IX-1969 (D. Westrom), 1 ♀ 2-VI-1970, 1 ♀ 9-X-1969, 2 ♀♀ 22-X-1969, 1 ♀ 29-VI-1970, 1 ♀ 14-VII-1970 (P. Rubtzoff); 3 ♂♂, 2 ♀♀ laboratory reared



FIGS. 6–9. FIG. 6. Male hypopygium (posterior view) of *F. thelaziae*. FIG. 7. Same in profile. FIG. 8. Female postabdomen (ventral view) and spermathecae of *F. thelaziae*. FIG. 9. Same for *F. conspicua*.

from eggs of females collected (11–18)-IX-1969. Hastings Reservation, Monterey County, 42 ♀♀ 18-IX-1969, 7 ♀♀ 13-VIII-1970, 2 ♀♀ 22-IX-1970 (C. J. Weinmann); 347 ♂♂, 156 ♀♀ laboratory reared from eggs of females collected 18-IX-1969. Guerneville, 5.5 mi. E., Sonoma County, 1 ♀ 9-IX-1970 (P. Rubtzoff); 1 ♂, 1 ♀ laboratory reared from eggs of female captured 9-IX-1970.

Holotype, allotype and 10 paratypes deposited in the California Academy of Sciences, San Francisco. Additional paratypes have been placed in the American Museum of Natural History, New York; British Museum (Natural History), London; California Department of Public Health, Bureau of Vector Control, Berkeley; Canadian National Collection, Ottawa; Florida State Collection of Arthropods, Gainesville; Oregon State University, Corvallis; United States National Museum, Washington D.C.; University of California, Berkeley; Washington State University, Pullman; and Zoological Museum, Copenhagen.

Males of this species possess characters intermediate between several recognized species in the *benjamini* subgroup. In the male, the dark brown mesoscutum of *F. thelaziae* is typical only of *F. benjamini* while the yellowed abdomen and leg bristles suggest some similarity to *F. arizonensis*. Both *F. thelaziae* and *F. arizonensis* have several features of male genitalia in common, including the basic outline of the dististylus and the strongly curved bacillus process. In fact, the dististylus of *F. thelaziae* differs from that of *F. arizonensis* only in the absence of the basal swelling.

All females of the *benjamini* subgroup appear quite similar to each other, except perhaps to *F. benjamini* itself which lacks the typical yellow lateral markings at the base of the abdomen. In *F. conspicua* the mark-

ings are present but appear yellowish gray and are sometimes quite difficult to see. *Fannia thelaziae* females most closely resemble females of *arizonensis*. The spermathecae are similar in shape, size and structure in both species.

Both sexes of *F. thelaziae* lack posteroventral bristles on the hind coxae although they are present in all other species included in the *benjamini* subgroup by Chillcott. Even though lacking these bristles, *F. thelaziae* is retained in the *benjamini* group on the basis of its color pattern in both sexes, and the structure of the male genitalia and female spermathecae. Chillcott suggested an affinity between the *benjamini* and *pretiosa* groups. This latter group is characterized in part by unbristled metacoxae. The absence of these bristles in *F. thelaziae* would seem to strengthen the association of these groups.

As this species has now been incriminated as the vector of the mammalian eyeworm, *Thelazia californiensis* (Weinmann, *et al.*, 1974), the name *F. thelaziae* seems most appropriate.

ADULT SEASONAL ACTIVITY.—Collecting dates extend from 2 June to 22 October. Most specimens taken in the field were captured in early to mid September.

DISTRIBUTION.—Although collection records of this species are limited, the species appears to occur primarily at the margins of oak woodland areas of the San Francisco Bay Area and in adjacent counties from Mendocino County in the north to Monterey County in the south. At each locality sampled, *F. thelaziae* was sympatric and synchronic with both *F. benjamini* and *F. conspicua*.

FANNIA CONSPICUA Malloch
(Figs. 1–3 and 9)

Fannia conspicua Malloch, 1913: 624.

FEMALE: *Head.*—Parafrontals brownish gray pollinose, about as wide as frontal vitta and convex on inner margin. Parafrontals tending to silvery gray; setulae uniserial, extending down onto parafacials well below aristal base. Oral membrane yellowish brown often making the oral margin beneath antennae appear yellowish. Third antennal segment broadly yellow at base, especially along inner ventral margin; base of arista yellowish. Palpus bright yellow, distinctly spatulate.

Thorax.—Gray pollinose, with faint narrow brown median vitta; lateral vitta reduced to dark brown spots about the bases of strong dcr bristles and irregular markings in intraalar rows. Scutellum with two more or less distinct brown spots subbasally. Squamae and their margins concolorous.

Abdomen.—Basal two or three segments faintly yellowish gray becoming gray laterally and on distal half or entirely gray with no hint of yellow coloration; remainder of abdomen gray pollinose with discontinuous brown median and large brown sublateral spots. Spermathecae two (Fig. 9).

Legs.—Yellowish to brownish yellow; base of F_1 brownish, tarsi black, pvs strong apically, evenly decreasing to base. F_2 avs and pvs present as regular, weak and suberect setulae; T_2 medially with one each av, ad, pd and subapical d, all subequal to tibial diameter, and 0–2 pvs appearing shorter and weaker. F_3 (Fig. 3) avs and pvs reduced to setulae except for two or three stronger preapical avs; T_3 avs 1 or 2, ads one median subequal to tibial diameter, d two, stronger and definitely longer than tibial diameter.

Malloch (1913) described *F. conspicua* from a single male specimen taken at Williams, Arizona. Females of this species are similar to most other females included in the *benjamini* subgroup. They are most easily recognized by their particular leg bristle patterns cited in the key. The yellow sublateral markings at the base of the abdomen in this species are quite variable. They are usually apparent in most specimens but in a significant number the color tends to yellowish gray and the marks appear restricted to the extreme lateral margins where they are very difficult to see. In still others the basal segments are entirely gray. In these latter individuals the yellow on the base of the third antennal segment, as is characteristic of *F. conspicua*, appears extensive and nearly always includes the base of arista. These specimens then, while looking much like females of *F. benjamini*, may be recognized by this antennal character.

ADULT SEASONAL ACTIVITY.—California records of *F. conspicua* range from 14 July to 29 October. A single Arizona record (no collecting date for the type is given) cited by Chillcott (1960) is considerably earlier (12 April).

DISTRIBUTION.—Chillcott (1960) recorded the species from Arizona and cited but two records, the type locality and Tempe. Since his study this species has been collected at a few locations in northern and central California, in particular Mendocino, Contra Costa and Monterey Counties. *Fannia conspicua* will probably be discovered at a number of localities between the extremes of its present known distribution.

MATERIAL EXAMINED.—CALIFORNIA: Russelmann Park (nr. Mt. Diablo), Contra Costa County, 2 ♀♀ 29-VII-1969, 1 ♀ 10-IX-1969 (P. Rubtzoff); 1 ♀ laboratory reared from egg of female captured 10-IX-1969. Hopland University of California, Hopland Field Station (4 mi. east of Hopland), Mendocino County, 5 ♀♀ (11–18)-IX-1969, 3 ♀♀ 25-IX-1969, 4 ♀♀ 30-IX-1969 (D. Westrom), 3 ♀ 29-X-1969, 1 ♂, 1 ♀ 14-VII-1970, 1 ♀ 21-VII-1970 (P. Rubtzoff); 12 ♂♂, 56 ♀♀ laboratory reared from eggs of females captured (11–18)-IX-1969, Hastings Reservation, Monterey County, 4 ♀♀ 18-IX-1969 (C. J. Weinmann); 124 ♂♂, 204 ♀♀ laboratory reared from eggs of females captured 18-IX-1969.

Female specimens of *F. conspicua* have been placed in the American Museum of Natural History, New York; California Academy of Sciences, San Francisco; British Museum (Natural History), London; California Department of Public Health, Bureau of Vector Control, Berkeley; Canadian National Collection, Ottawa; Florida State Collection of Arthropods, Gainesville; Oregon State University, Corvallis; United States National Museum, Washington, D.C.; University of California, Berkeley; Washington State University, Pullman; and Zoological Museum, Copenhagen.

KEY TO NEARCTIC SPECIES OF THE *FANNIA BENJAMINI* SUBGROUP (modified from Chillcott, 1960)

1. Eyes contiguous or nearly so (males) 2
   Eyes distinctly separated (females) 8
2. Thorax dark brown pollinose, not noticeably vittate 3
   Thorax clearly vittate 4
3. Abdomen dark gray with pollen basally; third antennal segment black; C_3 pvs present (California) ..... *benjamini* Malloch
   Abdomen yellow laterally on basal segments; third antennal segment yellow narrowly at base, rarely all black; C_3 pvs absent (California) ..... *thelaziae* n. sp.
4. F_3 avs with a distinct cluster of longer bristles medially, only one strong preapical bristle (Fig. 2) 5
   F_3 with two to four strong preapical avs, no strong avs medially 6
5. F_3 avs and pvs at least as long as femoral diameter where situated (Arizona, California) ..... *conspicua* Malloch
   F_3 av and pv bristles distinctly weaker, the pvs never as long as femoral diameter (New Mexico) ..... *neotomaria* Chillcott
6. F_3 with four strong preapical avs (California) ..... *operta* Chillcott
   F_3 with two (rarely three) strong preapical avs 7
7. F_3 with four to six strong pvs forming a tight cluster which does not grade into setulae basad (Arizona) ..... *tescorum* Chillcott
   F_3 with four or five slender pv bristles in loose cluster continued basad as erect setulae (Arizona) ..... *arizonensis* Chillcott
8. Basal abdominal segments dark, overlaid with gray pollinosity 9
   Basal abdominal segments yellowish, at least yellowish gray laterally; if abdomen is entirely gray, then arista yellowish basally 10
9. Femora largely infuscated; thorax mostly dark brown (California) ..... *operta* Chillcott
   Femora mostly yellowish; thorax gray pollinose (California) ..... *benjamini* Malloch
10. C_3 without pv bristles; third antennal segment yellow narrowly at base, arista entirely dark (California) ..... *thelaziae* n. sp.
    C_3 with one or two pvs (Fig. 1); arista and third antennal segment broadly yellow basally 11
11. T_2 median bristles longer than tibial diameter (Arizona) ..... *tescorum* Chillcott
    T_2 median bristles equal to or shorter than tibial diameter 12
12. Basal abdominal segments 2–4 distinctly yellowish (Arizona) ..... *arizonensis* Chillcott
    Abdominal segment 2 and usually 3 yellowish, color often very indistinct or tending to yellowish gray and confined to lateral areas; segment 4 gray (Arizona, California) ..... *conspicua* Malloch

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ZOOLOGICAL NOMENCLATURE

The following Opinions recently published by the Commission may be found by referring to the indicated volume of the Bulletin of Zoological Nomenclature.

1038 *Argiope* Audouin, 1826 and *lobata*, *Aranea*, Pallas, 1772, placed on Official Lists (Arachnida, Aranes). Vol. 32(2):105.

1039 Type-species of *Uloma* Dejean, 1821 (*Tenebrio culinaris* Linnaeus, 1758) and of *Phaleria Latreille*, 1802 (*Tenebrio cadaverinus* Fabricius, 1792) designated under the plenary powers; these names, with *Alphitobius* Stephens, 1829 and *Gnatocerus* Thunberg, 1814, and the names of their type-species, placed on Official Lists (Coleoptera). Vol. 32(3):136.

1042 *Deuterosminthurus* Börner, 1901; *Smynthurus bicinctus* Koch, in Herrich-Schaeffer, 1840 designated as type-species under the plenary powers (Collembola). Vol. 32(4):212.

1043 *Eusminthurus* Borner, 1900; *Podura viridis* Linnaeus, 1758 designated as type-species under the plenary powers (Collembola). Vol. 32(4):214.

1049 *Macgillivraya* Grote, 1894 suppressed under the plenary powers; *Friesea* von Dalla Torre, 1895 (type-species *Triaena mirabilis* Tullberg, 1871) placed on Official List (Collembola). Vol. 32(4):235.

1050 *Pediculus eurysternus* Burmeister, 1838 suppressed under the plenary powers; *Solenopotes* Enderlein, 1904 (type-species *S. capillatus* Enderlein, 1904) and *eurysternus*, *Haematopinus*, Denny, 1842, placed on Official Lists (Anoplura). Vol. 32(4):238.

1051 *Rhopalidia* Lepeletier, 1836 suppressed under the plenary powers (Hymenoptera). Vol. 32(4):240.

1053 *Formica maxima* Moore, 1842, suppressed under the plenary powers (Hymenoptera). Vol. 32(4):244.

1054 *Crinocerus* Burmeister, 1835; *Cimex sanctus* Fabricius, 1775, designated as type-species under the plenary powers (Hemiptera). Vol. 32(4):246.

The Commission cannot supply separates of Opinions.—R. V. MELVILLE, *Secretary, International Commission on Zoological Nomenclature.*